

INITIAL REVIEW ENGINEERING REPORT
PMN: 19-0140

Post Scoping v2 7/17/2020

ENGINEER: Austin \ Avcin \ MLS \ CMF and MLS

PV (kg/yr):

Revision Notes / Assessment Overview: Post scoping draft v1 (7/15/2020): Submitter provided additional monitoring data. (1) This IRER was revised to update all inhalation exposure estimates. (2) The vapor release estimates were removed from the IRER because they are no longer needed for the inhalation exposure estimates, as RAD used surrogate monitoring data described above. /// Post scoping draft v1 (3/25/2020): Based on new information received from the submitter, the following updates were made: (1) Submitter provided detailed PPE information for the MFG operation. This information was added to the inhalation and dermal basis notes in MFG. The inhalation and dermal estimates were not changed because RAD does not incorporate PPE use into exposure estimates. (2) For RAD removed the portion of the release that is destroyed from the model because the destroyed portion is not released. (3) Submitter process diagram in EPA presentation attachments indicates the in MFG occurs days/yr over hr/day. RAD updated these values for the loading release and exposure models in MFG (was previously day/yr, hr/day, per main submission document). (4) Submitter information in presentation to EPA indicates that the

(5)

The MFG process description and the title of the loading activity in MFG were updated to reflect this. (7) For MFG, equipment cleaning, RAD added worker exposure to be consistent between and submission information.

SUBMITTER:

USE: Intended use:

Synthetic scheme:

Analogues (same use):

Patents (same use):

OTHER USES: Analogues (other uses):

Analogues (same use and other uses):

Patents (other uses):

MSDS: Yes

Label: No

Gen Eqpt: Hand protection Material : Neoprene. // Eye protection: Safety galsses. // Skin and body protection : Select appropriate protective clothing based on chemical resistance data and an assessment of the local exposure potential. Wear the following personal protective equipment: Flame retardant antistatic protective clothing, unless assessment demonstrates that the risk of explosive atmospheres or flash fires is low Skin contact must be avoided by using impervious protective clothing (gloves, aprons, boots, etc).

Respirator: General and local exhaust ventilation is recommended to maintain vapor exposures below recommended limits. Where concentrations are above recommended limits or are unknown, appropriate respiratory protection should be worn. Follow OSHA respirator regulations (29 CFR 1910.134) and use NIOSH/MSHA approved respirators. Protection provided by air purifying respirators against exposure to any hazardous chemical is limited. Use a positive pressure air supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstance where air purifying respirators may not provide adequate protection.

Health Effects: Highly flammable and vapor. Vapors may form explosive mixture with air.

TLV/PEL:

CRSS (08/05/2019):

Chemical Name: [REDACTED]

S-H2O: 0.0066 g/L @

VP: [REDACTED] torr @

MW: [REDACTED] 0.00%<500 0.00%<1000

Physical State and Misc CRSS Info:

Neat: [REDACTED] Mfg: [REDACTED] Proc/Form: NA End Use: Destroyed.

Submitted Data: [REDACTED]

Literature Data [STN eProp]: BP = 66°C at 760 torr.

Estimated Data [EPI with MP = -80°C, BP = 73.5°C, VP = 108 torr, [REDACTED] BP = 99.78°C; VP = 125 torr; WS = 0.00656 g/L; log P = 4.50. .

Estimated Data [STN/ACD Labs]: BP = 107.1°C; VP = 32 torr; WS = 250 g/L; log P = 8.035. This estimated WS above is not credible, given the OECD 105 study showing a measured WS < [REDACTED] g/L. Likewise, the above estimated log P is too high, given that the corresponding estimated WS is [REDACTED] g/L.

Note about partition coefficient study done according to OECD 107 (shake flask method):

The study authors observed that the PMN substance reacted over time when stirred in n-octanol. After five hours of stirring, only [REDACTED] of the original amount of the PMN substance remained by GC measurement. [REDACTED]

Consumer Use: No

SAT (concerns) (08/12/2019):

Related Cas

Analogues: [REDACTED]

Migration to groundwater: Moderate to rapid

PBT rating: P3B2T0

Health: Dermal, Drinking Water, Inhalation, Other

Eco: 2 Water (All releases to water with a CC = 37 ppb)

OCCUPATIONAL EXPOSURE RATING: [REDACTED]

NOTES & KEY ASSUMPTIONS:

Occupational exposure and environmental releases were estimated using the ChemSTEER v3.2 (5/12/2016). Input to ChemSTEER tool includes information from: the PMN submission, physical / chemical properties, and relevant past cases. SAT concerns are for dermal, drinking water, and inhalation exposures. All releases to water with a CoC = 37 ppb. // PMN is synthetic sequence [REDACTED]. The following same submitter, similar use (volatile chemical intermediates) were referenced for consistency: [REDACTED] // MFG: This IRER assesses air releases to specified control technology and process wastes per the submitter estimates (consistent with all past cases). This IRER assessed air releases and associated inhalation exposure for activities specified in the submission as having exposure potential (consistent with all past cases). This IRER assessed dermal exposure during sampling (consistent with all past cases). // USE was not assessed because it occurs outside of the US.

POLLUTION PREVENTION CONSIDERATIONS:

P2 Claims: [REDACTED]

EXPOSURE-BASED REVIEW: No

INITIAL REVIEW ENGINEERING REPORT

PMN: 19-0140

Manufacturing: Batch

Number of Sites/ Location: [REDACTED]

[REDACTED]

Days/yr: [REDACTED]

Basis: Submission identifies [REDACTED] and indicates operation occurs over [REDACTED] bt/year, [REDACTED] hr/bt, with [REDACTED] kg PMN produced/bt. PMN is [REDACTED] in product. RAD specifies [REDACTED] bt/yr, and [REDACTED] PMN in product. CS calculates [REDACTED] kg PMN/day (consistent with the submission).

Process Description: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] (submission) // Note: USE is not assessed because it occurs outside of the US.

ENVIRONMENTAL RELEASES ESTIMATE SUMMARY

IRER Note: The daily releases listed for any source below may coincide with daily releases from the other sources to the same medium. // Submission indicates all building air is sent to thermal oxidizer. Release from thermal oxidizer is assessed in a separate activity during MFG.

Air

Output 2: [REDACTED] kg/site-day over [REDACTED] days/yr from [REDACTED]
or [REDACTED] kg/site-yr from [REDACTED] or [REDACTED] kg/yr-all sites
to: [REDACTED] destroyed in thermal oxidizer, [REDACTED] stack air
(submission)
from: [REDACTED]
basis: User-Defined Loss Rate Model. Submission estimates [REDACTED] kg
PMN/bt vented to the thermal oxidizer with an efficiency of [REDACTED]
[REDACTED] RAD assesses the [REDACTED] release to stack air in this model.

Incineration

Output 2: [REDACTED] kg/site-day over [REDACTED] days/yr from [REDACTED]
or [REDACTED] kg/site-yr from [REDACTED] or [REDACTED] kg/yr-all sites
to: off-site hazardous waste incineration with a [REDACTED]
efficiency (submission)
from: [REDACTED]
basis: User-Defined Loss Rate Model. Submission indicates
sampling occurs twice, with [REDACTED] kg/bt released over [REDACTED] days/yr
from one type of sampling and [REDACTED] kg/bt released over [REDACTED] days/yr
from the other sampling. RAD assessed release of [REDACTED] kg/bt over
[REDACTED] day/yr. Per submission sample waste is released to off-site
hazardous waste incineration with a [REDACTED] efficiency.

Incineration

Output 2: [REDACTED] kg/site-day over [REDACTED] days/yr from [REDACTED]
or [REDACTED] kg/site-yr from [REDACTED] or [REDACTED] kg/yr-all sites
to: off-site hazardous waste incineration with a [REDACTED]
efficiency (submission)
from: Equipment Cleaning Losses of [REDACTED] from Multiple Vessels
basis: User-Defined Loss Rate Model. Submission specifies [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] Submission estimates [REDACTED] kg PMN/bt
released during equipment cleaning to off-site hazardous waste
incineration with a [REDACTED] efficiency.

Landfill

Output 2: [REDACTED] kg/site-day over [REDACTED] day/yr from [REDACTED]
or [REDACTED] kg/site-yr from [REDACTED] or [REDACTED] kg/yr-all sites
to: hazardous waste landfill (submission)
from: Agitated Bed Reactor Solids Disposal
basis: User-Defined Loss Rate Model. Submission estimates a
release of [REDACTED] kg/bt over [REDACTED] day/yr to hazardous waste landfill
from removal of spent solids from agitated bed reactor.

RELEASE TOTAL

[REDACTED] kg/yr - all sites

OCCUPATIONAL EXPOSURES ESTIMATE SUMMARY

Tot. # of workers exposed via assessed routes: ■

Basis:

Inhalation:

Per November 2016 RAD guidance, the following default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years. Because of a ChemSTEER bug, these numbers were reversed to allow for calculation (BW = 78 kg and ATc = 80 years). // Per submission: During sampling, workers wear supplied air loose or tight-fitting NIOSH-approved respirator, with an Assigned Protection of at least 1000, butyl acid suit, and butyl gloves. During packout, workers are required to wear protective Nomex clothing, goggles, and butyl rubber gloves. There is also an alarm system in place set to go off if the ambient air concentration of total vinyl ethers in certain areas of the production environment goes above 0.3 ppm. The use of PPE may mitigate worker exposures. However, EPA does not assess the effectiveness of PPE at mitigating screening-level exposure estimates. Exposure mitigation by PPE is affected by many factors including availability, cost, worker compliance, impact on job performance, chemical and physical properties of the substance and protective clothing, and the use, decontamination, maintenance, storage, and disposal practices applicable to the industrial operation.

Exposure to Vapor (volatile) (Class II)

Average:

> Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
> Air conc, duration: [REDACTED] mg/m3 for [REDACTED] hr/day
> Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
> Average Daily Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr
> Acute Potential Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr

Upper Bound:

> Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
> Air conc, duration: [REDACTED] mg/m3 for [REDACTED] hr/day
> Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
> Average Daily Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr
> Acute Potential Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr

Number of workers (all sites) with inhalation exposure: [REDACTED]

Basis: Sampling [REDACTED] Product; User-defined Inhalation Model. CS models cannot be used since VP>35. Submitter provided area monitoring data of total acid fluorides at two locations in the manufacturing facility, to be representative of the NCS air concentration. These data indicate an average of [REDACTED] ppm and maximum of [REDACTED] ppm. RAD notes the following uncertainties in the submitter's data: the samples not personal breathing zone [which is more representative of worker exposure], it is unknown how close sampling points were to points of worker exposure, and the sample times are unknown. However, no appropriate surrogate monitoring data are available in the 2015 Fluorocarbon Substitutes Inhalation Exposure Data Summary document, so RAD uses the submitter's data. Typical concentration: Cm = [REDACTED] mg/m3; exposure duration: h = [REDACTED] hr/day (per submission). Worst-case concentration: Cm = [REDACTED] mg/m3; exposure duration: h = [REDACTED] hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
- 2)a) Exposure level > 1 mg/day? Yes
- OR
- b) Hazard Rating for health of 2 or greater? No
- => Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (volatile) (Class II)

Average:

- > Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
- > Air conc, duration: [REDACTED] mg/m3 for [REDACTED] hr/day
- > Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
- > Average Daily Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr
- > Acute Potential Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr

Upper Bound:

- > Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
- > Air conc, duration: [REDACTED] mg/m3 for [REDACTED] hr/day
- > Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
- > Average Daily Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr
- > Acute Potential Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr

Number of workers (all sites) with inhalation exposure: [REDACTED]

Basis: Equipment Cleaning Losses of [REDACTED] from Multiple Vessels; CS models cannot be used since VP>35. Submitter provided area monitoring data of total [REDACTED] at two locations in the manufacturing facility, to be representative of the NCS air concentration. These data indicate an average of [REDACTED] ppm and maximum of [REDACTED] ppm. RAD notes the following uncertainties in the submitter's data: the samples not personal breathing zone [which is more representative of worker exposure], it is unknown how close sampling points were to points of worker exposure, and the sample times are unknown. However, no appropriate surrogate monitoring data are available in the 2015 Fluorocarbon Substitutes Inhalation Exposure Data Summary document, so RAD uses the submitter's data. Typical concentration: Cm = [REDACTED] mg/m3; exposure duration: h = [REDACTED] hr/day (per submission). Worst-case concentration: Cm = [REDACTED] mg/m3; exposure duration: h = [REDACTED] hr/day. [REDACTED] day/yr per submitter
NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
2)a) Exposure level > 1 mg/day? Yes
OR
b) Hazard Rating for health of 2 or greater? No
=> Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (volatile) (Class II)

Average:

- > Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
- > Air conc, duration: [REDACTED] mg/m3 for [REDACTED] hr/day
- > Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
- > Average Daily Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr
- > Acute Potential Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr

Upper Bound:

- > Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
- > Air conc, duration: [REDACTED] mg/m3 for [REDACTED] hr/day
- > Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
- > Average Daily Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr
- > Acute Potential Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr

Number of workers (all sites) with inhalation exposure: [REDACTED]

Basis: Agitated Bed Reactor Solids Disposal; CS models cannot be used since VP>35. Submitter provided area monitoring data of total [REDACTED] at two locations in the manufacturing facility, to be representative of the NCS air concentration. These data indicate an average of [REDACTED] ppm and maximum of [REDACTED] ppm. RAD notes the following uncertainties in the submitter's data: the samples not personal breathing zone [which is more representative of worker exposure], it is unknown how close sampling points were to points of worker exposure, and the sample times are unknown. However, no appropriate surrogate monitoring data are available in the 2015 Fluorocarbon Substitutes Inhalation Exposure Data Summary document, so RAD uses the submitter's data. Typical concentration: Cm = [REDACTED] mg/m3; exposure duration: h = [REDACTED] hr/day (per submission). Worst-case concentration: Cm = [REDACTED] mg/m3; exposure duration: h = [REDACTED] hr/day. NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

INHALATION MONITORING DATA REVIEW

- 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): Yes
- 2)a) Exposure level > 1 mg/day? Yes
- OR
- b) Hazard Rating for health of 2 or greater? No
- => Inhalation Monitoring Data Desired? **No**

Exposure to Vapor (volatile) (Class II)

Average:

- > Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
- > Air conc, duration: [REDACTED] mg/m3 for [REDACTED] hr/day
- > Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
- > Average Daily Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr
- > Acute Potential Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr

Upper Bound:

- > Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
- > Air conc, duration: [REDACTED] mg/m3 for [REDACTED] hr/day
- > Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
- > Average Daily Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr
- > Acute Potential Dose: [REDACTED] mg/kg/day over [REDACTED] days/yr

Number of workers (all sites) with inhalation exposure: [REDACTED]

Basis: [REDACTED]
[REDACTED] CS models cannot be used since VP> [REDACTED] Submitter provided area monitoring data of total acid foluorides at two locations in the manufacturing factility, to be representative of the NCS air concentration. These data indicate an average of [REDACTED] ppm and maximum of [REDACTED] ppm for container loading. RAD notes the following uncertainties in the submitter's data: the samples not personal breathing zone [which is more representative of worker exposure], it is unknown how close sampling points were to points of worker exposure, and the sample times are unknown. However, no appropriate surrogate monitoring data are available in the 2015 Fluorocarbon Substitutes Inhalation Exposure Data Summary document, so RAD uses the submitter's data (note that the submitter's upper bound value, [REDACTED] ppm, is consistent with the maximum air concentration for cyclinder packaging in the Fluorocarbon Substitutes document). Typical concentration: $C_m =$ [REDACTED] mg/m3; exposure duration: $h =$ [REDACTED] hr/day (per submission). Worst-case concentration: $C_m =$ [REDACTED] mg/m3; exposure duration: $h =$ [REDACTED] hr/day.

NOTE: The respirator class is: II. Gas/vapor (all substances in the gas form).

INHALATION MONITORING DATA REVIEW

- | | |
|-----------------------------------------------------------------------------------------------|-----------|
| 1) Uncertainty (estimate based on model, regulatory limit, or data not specific to industry): | Yes |
| 2)a) Exposure level > 1 mg/day? | Yes |
| OR | |
| b) Hazard Rating for health of 2 or greater? | No |
| => Inhalation Monitoring Data Desired? | No |

Dermal:

Per November 2016 RAD guidance, default parameters for this model were updated: body weight (BW) was updated from 70 to 80 kg and Averaging Time over a Lifetime (ATc) was updated from 70 to 78 years. // Per submission: During sampling, workers wear supplied air loose or tight-fitting NIOSH-approved respirator, with an Assigned Protection of at least 1000, butyl acid suit, and butyl gloves. During packout, workers are required to wear protective Nomex clothing, goggles, and butyl rubber gloves. PPE may mitigate worker exposures. The submitter provided breakthrough testing of [REDACTED] (different than PMN) for the butyl gloves used by workers in the process and showed that there is no permeation after 480 minutes of exposure. The use of this PPE may mitigate worker exposures. However, EPA does not assess the effectiveness of PPE at mitigating screening-level exposure estimates. Exposure mitigation by PPE is affected by many factors including availability, cost, worker compliance, impact on job performance, chemical and physical properties of the substance and protective clothing, and the use, decontamination, maintenance, storage, and disposal practices applicable to the industrial operation.

Exposure to [REDACTED] at [REDACTED] concentration

High End:

> Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
> Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
> Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
> Acute Potential Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
Number of workers (all sites) with dermal exposure: [REDACTED]
Basis: Sampling [REDACTED] Product; EPA/OPPT 1-Hand Dermal Contact
with [REDACTED] Model. 12 day/yr per submitter

Exposure to Solid at [REDACTED] concentration

High End:

> Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
> Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
> Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
> Acute Potential Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
Number of workers (all sites) with dermal exposure: [REDACTED]
Basis: Agitated Bed Reactor Solids Disposal; EPA/OPPT Direct
2-Hand Dermal Contact with Solids Model.

Exposure to [REDACTED] at [REDACTED] concentration

High End:

> Potential Dose Rate: [REDACTED] mg/day over [REDACTED] days/yr
> Lifetime Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
> Average Daily Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
> Acute Potential Dose: [REDACTED] mg/kg-day over [REDACTED] days/yr
Number of workers (all sites) with dermal exposure: [REDACTED]
Basis: Loading [REDACTED] Product into Containers and Refilling Empty
Containers; EPA/OPPT 2-Hand Dermal Contact with [REDACTED] Model.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]